

C L A I M S

1. An image comparison system characterized by

2 comprising:

3 three-dimensional data input means for input

4 three-dimensional data of an object;

5 reference image storing means for storing a

6 reference image of at least one object;

7 pose candidate deciding means for generating

8 at least one pose candidate as a candidate for pose of

9 the object;

10 comparison image generating means for

11 generating at least one comparison image close to the

12 reference image while projecting the three-dimensional

13 data onto a two-dimensional image in accordance with the

14 pose candidate; and

15 image comparing means for performing

16 comparison on the basis of one of a distance value and a

17 similarity degree between the reference image and the

18 comparison image.

2. An image comparison system according to

2 claim 1, characterized in that said image comparing

3 means comprises:

4 calculating means for calculating one of the

5 distance value and the similarity degree between the

6 reference image and the comparison image;

7 selecting means for selecting one of a minimum

8 distance value which is a smallest distance value and a
9 maximum similarity degree which is a largest similarity
10 degree; and

11 comparing means for performing comparison on
12 the basis of one of a result of comparison between the
13 minimum distance value and a threshold value and a
14 result of comparison between the maximum similarity
15 degree and a threshold value.

3. An image comparison system according to
2 claim 1, characterized in that

3 said comparison image generating means
4 generates a comparison image close to each reference
5 image, and

6 said image comparing means comprises:

7 calculating means for calculating one of a
8 distance value and a similarity degree between each
9 reference image and the comparison image;

10 selecting means for selecting one of a minimum
11 distance value which is a smallest distance value and a
12 maximum similarity degree which is a largest similarity
13 degree for each reference image; and

14 comparing means for outputting, as a
15 comparison result, one of a reference image including a
16 smallest minimum distance value which is a smallest one
17 of minimum distance values and a reference image
18 including a largest maximum similarity degree which is a
19 largest one of maximum similarity degrees.

4. An image comparison system according to
2 claim 1, characterized by further comprising:
3 reference correction coefficient storing means
4 for storing a correction coefficient corresponding to
5 the reference image; and
6 correcting means for correcting one of the
7 minimum distance value and the maximum similarity degree
8 by using the correction coefficient.

5. An image comparison system according to
2 claim 1, characterized by further comprising reference
3 weighting coefficient storing means for storing a
4 weighting coefficient corresponding to the reference
5 image,
6 said image comparing means comprising
7 calculating means for calculating one of the distance
8 value and the similarity degree between the reference
9 image and the comparison image by using the weighting
10 coefficient corresponding to the reference image.

6. An image comparison system according to
2 claim 1, characterized by further comprising:
3 standard three-dimensional reference point
4 storing means for storing a standard three-dimensional
5 reference point corresponding to a standard
6 three-dimensional object model;
7 standard three-dimensional weighting
8 coefficient storing means for storing a standard
9 three-dimensional weighting coefficient;

10 three-dimensional reference point extracting
11 means for extracting a three-dimensional reference point
12 from the input three-dimensional data; and
13 input weighting coefficient converting means
14 for obtaining a coordinate correspondence of the
15 standard three-dimensional weighting coefficient to the
16 three-dimensional data by using the standard
17 three-dimensional reference point and the
18 three-dimensional reference point of the
19 three-dimensional data, and converting the standard
20 three-dimensional weighting coefficient into a
21 two-dimensional weighting coefficient in accordance with
22 the pose candidate,
23 said image comparing means comprising
24 calculating means for calculating one of the distance
25 value and the similarity degree between the reference
26 image and the comparison image by using the converted
27 two-dimensional weighting coefficient.

7. An image comparison system according to
2 claim 1, characterized by further comprising:
3 representative three-dimensional object model
4 storing means for storing representative ones of
5 three-dimensional object models as representative
6 three-dimensional object models;
7 group storing means for storing related
8 information of the representative three-dimensional
9 object models and reference images;

10 three-dimensional comparing means for
11 comparing the input three-dimensional data with the
12 representative three-dimensional object models, and
13 selecting a representative three-dimensional object
14 model similar to the three-dimensional data; and
15 reference image selecting means for selecting
16 a reference image corresponding to the selected
17 representative three-dimensional object model by
18 referring to the related information,
19 wherein said image comparing means compares
20 the selected reference image with the input
21 three-dimensional data.

 8. An image comparison system according to
2 claim 1, characterized by further comprising:
3 representative image storing means for storing
4 representative ones of images as representative images;
5 group storing means for storing related
6 information of the representative images and reference
7 images;
8 representative image selecting means for
9 comparing the input three-dimensional data with the
10 representative images, and selecting a representative
11 image similar to the three-dimensional data; and
12 reference image selecting means for selecting
13 a reference image corresponding to the selected
14 representative image by referring to the related
15 information,

16 wherein said image comparing means compares
17 the selected reference image with the input
18 three-dimensional data.

 9. An image comparison system according to
2 claim 4, characterized in that the correction
3 coefficient is determined on the basis of at least one
4 of a distance value and a similarity degree between a
5 representative three-dimensional object model and the
6 reference image.

 10. An image comparison method characterized
2 by comprising the steps of:
3 input three-dimensional data of an object;
4 generating at least one pose candidate as a
5 candidate for pose of the object;
6 generating at least one comparison image close
7 to a reference image while projecting the
8 three-dimensional data onto a two-dimensional image in
9 accordance with the pose candidate; and
10 performing comparison on the basis of one of a
11 distance value and a similarity degree between the
12 reference image and the comparison image.

 11. An image comparison method according to
2 claim 10, characterized in that the step of performing
3 comparison comprises the steps of:
4 calculating one of the distance value and the
5 similarity degree between the reference image and the
6 comparison image;

7 selecting one of a minimum distance value
8 which is a smallest distance value and a maximum
9 similarity degree which is a largest similarity degree;
10 and
11 performing comparison on the basis of one of a
12 result of comparison between the minimum distance value
13 and a threshold value and a result of comparison between
14 the maximum similarity degree and a threshold value.

12. An image comparison method according to
2 claim 10, characterized in that

3 the step of generating a comparison image
4 comprises the step of generating a comparison image
5 close to each reference image, and

6 the step of performing comparison comprises
7 the steps of:

8 calculating one of a distance value and a
9 similarity degree between each reference image and the
10 comparison image;

11 selecting one of a minimum distance value
12 which is a smallest distance value and a maximum
13 similarity degree which is a largest similarity degree
14 for each reference image; and

15 outputting, as a comparison result, one of a
16 reference image including a smallest minimum distance
17 value which is a smallest one of minimum distance values
18 and a reference image including a largest maximum
19 similarity degree which is a largest one of maximum

20 similarity degrees.

13. An image comparison method according to
2 claim 10, characterized by further comprising the step
3 of correcting one of the minimum distance value and the
4 maximum similarity degree by using a correction
5 coefficient corresponding to the reference image.

14. An image comparison method according to
2 claim 10, characterized in that the step of performing
3 comparison comprises the step of calculating one of the
4 distance value and the similarity degree between the
5 reference image and the comparison image by using a
6 weighting coefficient corresponding to the reference
7 image.

15. An image comparison method according to
2 claim 10, characterized by further comprising the steps
3 of:

4 extracting a three-dimensional reference point
5 from the input three-dimensional data; and

6 obtaining a coordinate correspondence of a
7 standard three-dimensional weighting coefficient to the
8 three-dimensional data by using a standard
9 three-dimensional reference point corresponding to a
10 standard three-dimensional object model and the
11 three-dimensional reference point of the
12 three-dimensional data, and converting the standard
13 three-dimensional weighting coefficient into a
14 two-dimensional weighting coefficient in accordance with

15 the pose candidate,
16 the step of performing comparison comprising
17 the step of calculating one of the distance value and
18 the similarity degree between the reference image and
19 the comparison image by using the converted
20 two-dimensional weighting coefficient.

16. An image comparison method according to
2 claim 10, characterized by further comprising the steps
3 of:

4 comparing the input three-dimensional data
5 with representative three-dimensional object models
6 which are representative ones of three-dimensional
7 object models, and selecting a representative
8 three-dimensional object model similar to the
9 three-dimensional data; and

10 selecting a reference image corresponding to
11 the selected representative three-dimensional object
12 model by referring to information indicating relations
13 between the representative three-dimensional object
14 models and reference images,

15 the step of performing comparison comprising
16 the step of comparing the selected reference image with
17 the input three-dimensional data.

17. An image comparison method according to
2 claim 10, characterized by further comprising the step
3 of:

4 comparing the input three-dimensional data

5 with representative images which are representative ones
6 of images, and selecting a representative image similar
7 to the three-dimensional data; and
8 selecting a reference image corresponding to
9 the selected representative image by referring to
10 information indicating relations between the
11 representative images and reference images,
12 the step of performing comparison comprising
13 the step of comparing the selected reference image with
14 the input three-dimensional data.

18. An image comparison method according to
2 claim 13, characterized by further comprising the step
3 of determining the correction coefficient on the basis
4 of at least one of a distance value and a similarity
5 degree between a representative three-dimensional object
6 model and the reference image.

19. A program for causing a computer to
2 execute:
3 a procedure of input three-dimensional data of
4 an object;
5 a procedure of generating at least one pose
6 candidate as a candidate for pose of the object;
7 a procedure of generating at least one
8 comparison image close to a reference image while
9 projecting the three-dimensional data onto a
10 two-dimensional image in accordance with the pose
11 candidate; and

12 a procedure of performing comparison on the
13 basis of one of a distance value and a similarity degree
14 between the reference image and the comparison image.

20. A program according to claim 19, wherein
2 in the procedure of performing comparison, the program
3 causes the computer to execute:

4 a procedure of calculating one of the distance
5 value and the similarity degree between the reference
6 image and the comparison image;

7 a procedure of selecting one of a minimum
8 distance value which is a smallest distance value and a
9 maximum similarity degree which is a largest similarity
10 degree; and

11 a procedure of performing comparison on the
12 basis of one of a result of comparison between the
13 minimum distance value and a threshold value and a
14 result of comparison between the maximum similarity
15 degree and a threshold value.

21. A program according to claim 19, wherein
2 in the procedure of generating a comparison
3 image, the program causes the computer to execute a
4 procedure of generating a comparison image close to each
5 reference image, and

6 in the procedure of performing comparison, the
7 program causes the computer to execute:

8 a procedure of calculating one of a distance
9 value and a similarity degree between each reference

10 image and the comparison image;
11 a procedure of selecting one of a minimum
12 distance value which is a smallest distance value and a
13 maximum similarity degree which is a largest similarity
14 degree for each reference image; and
15 a procedure of outputting, as a comparison
16 result, one of a reference image including a smallest
17 minimum distance value which is a smallest one of
18 minimum distance values and a reference image including
19 a largest maximum similarity degree which is a largest
20 one of maximum similarity degrees.

22. A program according to claim 19, which
2 further causes the computer to execute a procedure of
3 correcting one of the minimum distance value and the
4 maximum similarity degree by using a correction
5 coefficient corresponding to the reference image.

23. A program according to claim 10, wherein
2 in the procedure of performing comparison, the program
3 causes the computer to execute a procedure of
4 calculating one of the distance value and the similarity
5 degree between the reference image and the comparison
6 image by using a weighting coefficient corresponding to
7 the reference image.

24. A program according to claim 19, which
2 further causes the computer to execute:
3 a procedure of extracting a three-dimensional
4 reference point from the input three-dimensional data;

5 and
6 a procedure of obtaining a coordinate
7 correspondence of a standard three-dimensional weighting
8 coefficient to the three-dimensional data by using a
9 standard three-dimensional reference point corresponding
10 to a standard three-dimensional object model and the
11 three-dimensional reference point of the
12 three-dimensional data, and converting the standard
13 three-dimensional weighting coefficient into a
14 two-dimensional weighting coefficient in accordance with
15 the pose candidate,

16 wherein in the procedure of performing
17 comparison, the program causes the computer to execute a
18 procedure of calculating one of the distance value and
19 the similarity degree between the reference image and
20 the comparison image by using the converted
21 two-dimensional weighting coefficient.

25. A program according to claim 19, which
2 further causes the computer to execute:

3 a procedure of comparing the input
4 three-dimensional data with representative
5 three-dimensional object models which are representative
6 ones of three-dimensional object models, and selecting a
7 representative three-dimensional object model similar to
8 the three-dimensional data; and

9 a procedure of selecting a reference image
10 corresponding to the selected representative

11 three-dimensional object model by referring to
12 information indicating relations between the
13 representative three-dimensional object models and
14 reference images,
15 wherein in the procedure of performing
16 comparison, the program causes the computer to execute a
17 procedure of comparing the selected reference image with
18 the input three-dimensional data.

26. A program according to claim 19, which
2 further causes the computer to execute:

3 a procedure of comparing the input
4 three-dimensional data with representative images which
5 are representative ones of images, and selecting a
6 representative image similar to the three-dimensional
7 data; and

8 a procedure of selecting a reference image
9 corresponding to the selected representative image by
10 referring to information indicating relations between
11 the representative images and reference images,

12 wherein in the procedure of performing
13 comparison, the program causes the computer to execute a
14 procedure of comparing the selected reference image with
15 the input three-dimensional data.

27. A program according to claim 22, which
2 further causes the computer to execute a procedure of
3 determining the correction coefficient on the basis of
4 at least one of a distance value and a similarity degree

- 5 between a representative three-dimensional object model
6 and the reference image.